Remarks/Arguments:

This Amendment adds no new claims, and is provided to amend claims 1, 7, 9-11, 17, 19 and 20. No new matter has been added. Upon entry of this Amendment claims 1-20 will be pending. Claims 1, 7, 9, 10, 11, 17, 19 and 20 are independent.

Rejections of the Claims under 35 U.S.C. 103

The Examiner has maintained the rejection of claims 1, 7-11 and 17-20 under 35 U.S.C. 103(a) as being unpatentable over the publication entitled "Extraction Of Photographic Area From Document Images" of Osamu Nakamura et al. (hereinafter Nakamura) in view of U.S. Patent No. 5,212,741 of Barski et al. (hereinafter Barski).

As discussed in further detail below, the Nakamura reference does not disclose an edge enhancement part for enhancing edges of a character block classified previously by the block classification part, nor the generation of a threshold to then be used for binarizing pixels. Due in part to the Examiner's comments at page 5, lines 6-9, the Applicants felt a need to distinguish the edge enhancement part as recited from the Nakamura reference. In regard to the Barski reference, the Applicants assert that the Barski reference fails to disclose an edge enhancement part for enhancing edges of *each* character block, since regular text blocks are omitted from edge enhancement in the Barski reference (see Fig. 1), nor an enhancement part for enhancing edges of each character block classified by the block classification part, since the classification part of Barski divides regular text from dot matrix/inkjet text in contrast to the division of character blocks from background blocks. Accordingly, neither the Nakamura or Barski references, separately or in combination, describe the edge enhancement part as recited by the Applicants.

The Examiner points to Nakamura as disclosing a system and method for binarizing an image having an input part for receiving an image, a block classification part for dividing the received image into blocks and classifying the divided blocks into character blocks and background blocks, a block growing part for growing the classified character blocks and restoring blocks containing a character pixel, classified as a background block, to character blocks, a block grouping part for grouping a character block output from the block growing

part with its neighboring blocks thereby generating a grouped block, a block splitting part for separating the character block from the grouped block, and a binarization part for binarizing pixels of the separated character blocks into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the separated character blocks with a threshold, and binarizing pixels of a background block output from the block growing part into the second brightness value.

The Examiner points to Nakamura as further disclosing an edge enhancement part for use in classification and as such, not for use on the image subsequent to classification as recited by the Applicants. The Examiner points to Nakamura as still further disclosing a binarization part for binarizing pixels, but without the use of the threshold established during the edge enhancement stage as recited by the Applicants.

The Examiner points to Barski as disclosing an edge enhancement part for *enhancing edges of the character block* using relations between pixels in the grouped block, and *generating a threshold* for distinguishing character pixels and background pixels of the character block to be used in binarizing pixels of background blocks output from the block classification part into the second brightness values, purportedly anticipating the invention as recited by the Applicants.

The Nakamura reference describes a method for improved photographic area segmentation accuracy by using an extraction algorithm. The proposed extraction algorithm uses the characteristics of both edge elements and background gray levels. The method first extracts photographic areas using an extraction algorithm, and then blocks that are judged as being two-valued areas (described in greater detail below) are quantized and transformed into black and white using a notchless bi-level quantization.

For segmentation of the photographic area prior to the notchless bi-level quantization, the extraction algorithm notes that gray level changes are more frequent in textual parts (e.g., two-valued areas) than those of photographic areas (e.g., candidate areas) (see page 77, Part 2, first paragraph of the Nakamura reference). Accordingly, three steps are performed.

First, a derivative histogram is used to determine an upper threshold value T_s to decide what are two-valued areas, and what are candidate areas.

Second, for the two-valued areas only, a ratio T_e is determined, and for the candidate areas only, a ratio W_g is determined, and the two are compared for each candidate area block to determine if any candidate area blocks are to be converted to two-valued areas. However, the process can be reversed such that converted blocks can be returned to a candidate area again using ratios of each (see page 78, Equation (7)). Still further, candidate areas can be reclassified as two-valued areas using a positional relationship (see page 79, Part 5).

Third, for the candidate areas only of the first and second steps, the adjacent eight blocks of each candidate area are combined and still further expanded by one block width on each side and then divided into sub blocks, and elements of the first and second steps are then repeated. The final widened and integrated areas are considered the final potential candidate areas (see page 79, Part 4), and the final two-valued areas are quantized and transformed into black and white pictures (see page 80, Part 3). In doing so, the Nakamura reference describes a system for the bi-level quantization of the two-valued areas (e.g., textual parts) as segmented by the above three steps, resulting in the images shown in Nakamura Fig. 9 (see page 80).

The Nakamura reference describes a system for the segmentation and bi-level quantization of photographic areas, and the Examiner points to the Nakamura reference as disclosing a method and device for binarizing an image as recited by the Applicants. In regard to the input part, the Examiner points to the input image of Nakamura Fig. 1, and in regard to the block classification part, the Examiner points to at least the first step of the Nakamura segmentation as described above.

In regard to the edge enhancement part, the Examiner points to *Nakamura as disclosing an edge enhancement part for use in classification* and as such, not for use on the image subsequent to classification as recited by the Applicants, and points to *Barski as disclosing such an edge enhancement part for enhancing edges of the (classified) character block* using relations between pixels in the grouped block and *generating a threshold* for distinguishing character pixels and background pixels of the character blocks to be used in binarizing pixels.

More specifically, in regard to the edge enhancement part as recited by the Applicants, the Nakamura reference describes the calculation of tσ, which is used in the second step described above to separate the two-valued areas and candidate areas (see page 78, Equation (2)). To determine tσ, the Nakamura reference describes the use of a number Q of edge elements to first determine a percentage of edge elements to the total number of pixels (see page 81, last paragraph), plotted and from which, a value tσ is determined. In the calculation of tσ, edge pixels are considered in a ratio relation for purposes of designating two-valued areas and candidate areas (see Nakamura Fig. 13 and page 78, Equation (2)).

In contrast, the Applicants recite an edge enhancement part which enhances edges of the character blocks *previously classified by the block classification part*. That is, to avoid adverse effects when an image includes an irregularly lighted subject, the block classification is performed prior to edge enhancement (see page 3, lines 4-6, and Figs. 2-5). In doing so, edge enhancement is performed upon character blocks previously classified by the block classification part, followed by binarization of the separated blocks.

In response to the Applicants reply of June 27, 2008, the Examiner states that there is no reliance upon Nakamura for disclosing an edge enhancement part (see Office Action, page 2, lines 8-9). The Applicants misinterpreted the wording of the rejection at page 5, lines 6-9 which appears to rely upon Nakamura as disclosing elements of the edge enhancement part. However, as described in greater detail below, the Applicants assert that the Barski reference alone or in combination with the Nakamura reference, also fails to describe an edge enhancement part for enhancing edges of a character block using relations between neighboring pixels in the character block classified by the block classification part, and for generating a threshold for distinguishing character pixels and background pixels of the character block.

In regard to the Nakamura reference, in the first and second steps, a derivative histogram is used to determine a value T_s to decide what are two-valued areas and what are candidate areas, and for the two-valued areas only, a ratio T_e is determined, and for the candidate areas only, a ratio W_g is determined and the two are compared for each candidate area block to determine if any candidate area blocks are to be converted to two-valued areas.

However, this separation of areas is not performed prior to the steps as discussed in Nakamura Part 4, but are performed together. That is, the edge factor discussion of Nakamura Part 4 results in the value tσ, which is used in the second step described above to separate the two-valued areas and candidate areas (see page 78, Equation (2)). Accordingly, the steps of Nakamura Part 4 are integral to the area separation and are not performed after area separation.

Accordingly, the Nakamura reference does not disclose an edge enhancement part for enhancing edges of a character block classified previously by the block classification part, nor the generation of a threshold to then be used for binarizing pixels. That is, the Nakamura reference does not disclose a system and method wherein block classification is completed prior to the edge enhancement, nor the generation of a threshold to then be used for binarizing pixels. The Nakamura reference describes a system and method wherein edge factors (of Part 4) are clearly used as a factor in segmentation, which does not describe segmentation followed by edge enhancement and then binarization as recited by the Applicants.

In regard to the Barski as disclosing an edge enhancement part for enhancing edges of the character block using relations between pixels in the grouped block (that is, disclosing an edge enhancement part for enhancing edges of a character block classified previously by the block classification part), and for generating a threshold for distinguishing character pixels and background pixels of the character block to be used in binarizing pixels of background blocks output from the block classification part into the second brightness values, the Barski reference describes a system and method for identifying specific test applications (i.e., dot matrix) and if detected, performing pre-processing prior to binarization (see steps 10, 20 and 30 of Fig. 1). To do so, a histogram is first prepared followed by smoothing, contrast stretching, and edge enhancements steps (see steps 24, 26 and 28), prior to binarization.

However, Barski does not describe the edge enhancement of all character blocks. As seen in the flow chart of Barski Fig. 1, a determination is first made at step 10, and only text comprising dot matrix or inkjet printed text is pre-processed as noted by step 20. Regular

text is binarized without pre-processing, including the edge enhancement of step 20 part 28 (see step 16 of Fig. 1, and col. 4, lines 18-26).

In response to the Applicants reply of June 27, 2008, the Examiner questions the relevance of the assertion that Barski does not describe the edge enhancement of all character blocks, and that Barski still reads on the limitation of the Applicants' claims. Accordingly, to further distinguish the system and method as recited by the Applicants from the system and method of Barski Fig. 1, wherein edge enhancement is provided for detected dot matrix/inkjet text only, the Applicants have amended the independent claims to recite a system and method for providing and controlling an edge enhancement part for enhancing edges of *each* character block (in contrast to the dot matrix/inkjet text only blocks of the Barski reference) that have been *classified by the block classification part* (in contrast to the regular text - dot matrix/inkjet text classification step of the Barski reference), using relations between neighboring pixels in the character block classified by the block classification part, and generating a threshold for distinguishing character pixels and background pixels of the character block.

A reason for the importance of the edge enhancement of each character block can be derived from the Applicants' classification steps in contrast to the print detector of Barski block 10 (see again Fig. 1). The Barski reference describes the designation between regular text and dot matrix/inkjet text, wherein edge enhancement is of greater importance to dot matrix/inkjet text only. The Applicants classification steps describe the designation between character blocks and background blocks, wherein edge enhancement is of greater importance to character blocks.

Accordingly, the Applicants assert that the Barski reference fails to disclose an edge enhancement part for enhancing edges of each character block, since regular text blocks are omitted from edge enhancement in the Barski reference, nor an enhancement part for enhancing edges of each character block classified by the block classification part, since the classification part of Barski divides regular text from dot matrix/inkjet text in contrast to the division of character blocks from background blocks.

The Examiner further points to Barski as disclosing the edge enhancement part for *generating a threshold* for distinguishing character pixels and background pixels of the character block to be used in binarizing pixels of background blocks output from the block classification part into the second brightness values.

However, in regard to the binarization of step 16, no data from the pre-processing steps 20 is used (see again Fig. 1, and col. 4, lines 20-29). Further, the binarization of step 30 uses a threshold density value resulting from combined pre-processing steps of smoothing, contrast stretching, and edge enhancements prior to binarization (see col. 7, lines 20-28). That is, the edge enhancement step 28 is not solely relied upon for a threshold value.

In response to the Applicants reply of June 27, 2008, the Examiner questions the relevance of the assertion that the edge enhancement step 28 is not solely relied upon for a threshold value.

Accordingly, the Applicants note that the Barski reference describes the binarization at steps 16 and 30 of Fig. 1. The binarization of regular text at step 16 uses no data of the edge enhancement step 28 (i.e. no threshold of the edge enhancement step). The binarization of dot matrix/inkjet text at step 30 appears to follow the operation of the edge enhancement step 28 (see Barski col. 7, lines 20-28). However, the classification part of Barski divides regular text from dot matrix/inkjet text *in contrast* to the division of character blocks from background blocks as recited by the Applicants. In this case, the Applicants assert that both regular text and dot matrix/inkjet text would be analogous to the character blocks as recited by the Applicants for the sake of argument herein.

However, Barski only edge enhances dot matrix/inkjet text, and only the binarization of dot matrix/inkjet text at step 30 uses pre-processing information (i.e. threshold values allegedly resulting from the edge enhancement step 28) of step 20. Therefore, a clarified statement would be that the edge enhancement step 28 is not solely relied upon for a threshold value in the binarization of both steps 16 and 30, as step 16 of Barski is performed separately and relies upon some other value for binarization. Accordingly, the binarization of step 16 of Barski Fig. 1 does not describe a binarization part for binarizing pixels of character blocks (i.e., those including regular text) using a threshold value generated by the edge

enhancement part as recited by the Applicants, and the binarization of step 30 of Barski Fig. 1 does not describe a binarization part for each character block using a threshold value generated by the edge enhancement part as recited by the Applicants as regular text is processed separately.

For these reasons, the Applicants assert that the Nakamura and Barski references do not disclose or reasonably suggest each element as recited by the Applicants in independent claims 1, 7, 9, 10, 11, 17, 19 and 20 as amended, and the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 103(a).

Regarding claims 8 and 18, the Examiner, in addition to the reasons stated above, further points to Nakamura in view of Barski as disclosing a block growing part having a dilation part for growing a character block and changing a block containing a character pixel, classified as a background block, to a character block, and a closing part for eroding the dilated character block and deducting connected blocks, purportedly rendering obvious the invention as recited by the Applicants in claim 8, and a method thereof as recited by the Applicants in claim 18.

However, for the reasons stated above, the Applicants assert that the Nakamura and Barski references do not disclose or reasonably suggest each element as recited by the Applicants in independent claims 7 and 17, from which claims 8 and 18 depend. Accordingly, the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 103(a) of dependent claims 8 and 18 for the same reasons.

The Examiner has rejected claims 2, 3, 6, 12, 13 and 16 under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Barski, and further in view of the publication entitled "Adaptive, Quadratic Preprocessing Of Document Images For Binarization" of Shan Mo et al. (hereinafter Mo).

Regarding dependent claims 2, 6, 12 and 16, the Examiner, in addition to the reasons stated above, further points to Nakamura and Barski as disclosing an edge enhancement part and points to Mo as disclosing a system and method having a first threshold selection part for

calculating a first threshold for classifying each pixel of the character block as a character pixel or a background pixel, a mean computation part for classifying pixels of the character block into character pixels and background pixels on the basis of the first threshold, and calculating mean brightness values for character pixels and background pixels of the character block, a normalization part for normalizing pixels of the character block using the mean brightness value for character pixels and the mean brightness value for background pixels output from the mean computation part so that the character pixels have a value close to '1' while the background pixels have a value close to '0', a quadratic operation part for performing a quadratic operation on the normalized character block so as to enhance edges of the character block and reduce noise of the character block, a denormalization part for denormalizing the quadratic-processed character block and providing the denormalized character block to the binarization part, and a second threshold selection part for calculating a second threshold for classifying pixels into character pixels and background pixels, by normalizing the first threshold, and outputting the second threshold as a threshold for the binarization part and method thereof, purportedly rendering obvious the invention as recited by the Applicants in claims 2, 6, 12 and 16.

Regarding claims 3 and 13, the Examiner points to Nakamura and Barski as disclosing the claimed invention with the exception of the quadratic filter of the edge enhancement portion. The Examiner points to Mo as disclosing such a quadratic filter, purportedly rendering obvious the invention as recited by the Applicants in claims 3 and 13.

The Mo reference describes a system and method for an adaptive algorithm for pre-processing document images prior to binarization. The Mo reference recognizes that edge enhancement and noise reduction is desirable before binarization, and that normalization is desirable even before pre-processing. To do so, the Mo reference describes the use of a normalization step prior to the adaptive pre-processing algorithm (see page 995, Equation (7)). However, the Mo reference fails to describe the normalization and pre-processing algorithm arrangement as a block classification for the classification of both character and background blocks and from which, only character blocks are edge enhanced. That is, the Mo reference fails to disclose an edge enhancement part for enhancing edges of *each*

character block classified previously by the block classification part as recited by the Applicants.

For these reasons, the Applicants assert that the Nakamura, Barski and Mo references do not disclose or reasonably suggest each element as recited by the Applicants in independent claims 1 and 11, from which claims 2, 3, 6, 12, 13 and 16 depend, and the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 103(a) of dependent claims 2, 3, 6, 12, 13 and 16 for the same reasons.

The Examiner has rejected claims 4, 5, 14 and 15 under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Barski, and further in view of the publication entitled "Fast Segmentation Of The JPEG Compressed Documents" of de Queiroz et al. (hereinafter de Queiroz).

Specifically, regarding claims 4 and 14, the Examiner points to Nakamura and Barski as disclosing the claimed invention with the exception of a discrete cosine transformation block and the use of an energy calculation for region classification. The Examiner points to de Queiroz as disclosing such a discrete cosine transformation block and the use of an energy calculation for region classification, purportedly rendering obvious the invention as recited by the Applicants in claims 4 and 14.

Regarding claims 5 and 15, the Examiner points to de Queiroz as disclosing the block size and energy calculation, purportedly rendering obvious the invention as recited by the Applicants in claims 5 and 15.

The de Queiroz reference describes a system and method for the segmentation of JPEG-compressed images without decompression. However, as with the Nakamura and Barski references, the de Queiroz reference does not disclose an edge enhancement part for enhancing edges of *each* character block classified previously by the block classification part.

For these reasons, the Applicants assert that the Nakamura, Barski and de Queiroz references do not disclose or reasonably suggest each element as recited by the Applicants in independent claims 1 and 11, from which claims 4, 5, 14 and 15 depend, and the Applicants

respectfully request the withdrawal of the rejection under 35 U.S.C. 103(a) of dependent claims 4, 5, 14 and 15 for the same reasons.

Conclusion

In view of the above, it is believed that the application is in condition for allowance and notice to this effect is respectfully requested. Should the Examiner have any questions, the Examiner is invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

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